PHYTOCHEMICAL STUDIES ON CARDIOSPERMUM CANESCENS WALL.

M.P. Shivamanjunath & K.P. Sreenath
Department of Botany, Bangalore University, Jnanabharati, Bangalore, India

Abstract: There is an averness in the society about the use of herbal based medicine to cure ailments. So there is a demand for herbs lead to the pressure on the natural vegetation. It creates a problems on the ecosystems. A survey at Kanakapura taluk, Ramanagar district of Karnataka, an endangered plant Cardiospermum canescens WALL., is used to treat rheumatoid arthritis in addition to Cardiospermum halicacabum Linn., without knowing the difference between the two species. The phytochemical data reveals the presence of menthanamine and others, in addition to three similar phytochemicals.

Keywords: Survey, Endangered herb, Phytochemicals, Kanakapura, Arthritis.

I. Introduction

India is one of the richest biodiversity country, having its own traditional systems of medicine like Ayurveda, Siddha, Unani and Homeopathy. In addition to that, the ethnic people at different geological areas are practicing their own system of medicine and got the knowledge from their forefathers to cure the common ailments. Nowadays all over the globe the people are very much interested to use the herbal medicines than the synthetic drugs due to their less side effects and low cost. But there is less scientific evidence about the curative properties of these natural drugs. So there is a need of scientific validation. Hence, made an attempt to know the phytochemical constituents and validate a rare herb Cardiospermum canescens Wall.

The herbaceous Cardiospermum belongs to Sapindaceae and represents more than 30 species globally. The two species [1] are known to occur in India. Cardiospermum halicacabum L., is cosmopolitan in distribution, whereas Cardiospermum canescens Wall., is restricted only in some pockets of Karnataka, Tamil Nadu and Andhra Pradesh. Gamble (1918) [2] reported the occurrence of Cardiospermum canescens Wall., from Deccan region. In fact, ours is the first report from Karnataka after Gamble. The local people of Kanakapura region are banking on Cardiospermum canescens Wall., in driving out of rheumatoid arthritis. The leaf paste is used to treat the disorder. The traditional and chemical knowledge is meagre, when compared to Cardiospermum halicacabum L. [3].

II. Materials and methods

Aerial portion of Cardiospermum canescens was collected from Tulasidoddi of Kanakapura and identified and authenticated with the voucher specimen at herbarium of Botany Department, Bangalore University, Bangalore. The collected biomass is dried under shade and powdered by using mortar and pestle. The coarse powder is stored in airtight container and used for physico-chemical studies. Preliminary phyto-chemical screening was undertaken following the standard procedures [4]. Further extracts are subjected to fluorescence analysis, inorganic elements are determined through Atomic Absorption Spectrophotometer (GBC932AA-Hollow Cathode Lamp). Their chemical constituents are determined using GC-MS instrument model GC Clarus 500, Perkin Elmer with NIST computer mass spectral library. The Capillary column was Elite-1 (5% phenyl, 95% dimethyl polysiloxane).
III. Results

Table 1. Physico Chemical Constants

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Parameters (%)</th>
<th>Value % w/w</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Loss on drying</td>
<td>19.2</td>
</tr>
<tr>
<td>02</td>
<td>Total Ash content</td>
<td>4</td>
</tr>
<tr>
<td>03</td>
<td>Acid insoluble Ash</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Table 2. Extractive values

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Reagents</th>
<th>Value %</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Ethanol</td>
<td>4.19</td>
</tr>
<tr>
<td>02</td>
<td>Water</td>
<td>3.94</td>
</tr>
</tbody>
</table>

Table 3. Preliminary photochemical screening of water and alcohol extracts

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Test</th>
<th>Water</th>
<th>Alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Saponin</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>02</td>
<td>Protein</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>03</td>
<td>Tannin</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>04</td>
<td>Sterol</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>05</td>
<td>Terpenes</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>06</td>
<td>Sugar</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>07</td>
<td>Flavonoids</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>08</td>
<td>Lignin</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>09</td>
<td>Alkaloids</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>10</td>
<td>Starch</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>11</td>
<td>Gum</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Table 4. Fluorescence Analysis of Extract

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Extracts</th>
<th>Day light</th>
<th>UV Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Water</td>
<td>Light brown</td>
<td>Light green</td>
</tr>
<tr>
<td>02</td>
<td>Ethanol</td>
<td>Dark green</td>
<td>Dark green</td>
</tr>
<tr>
<td>03</td>
<td>Acetone</td>
<td>Dark green</td>
<td>Dark green</td>
</tr>
<tr>
<td>04</td>
<td>Ethyl acetate</td>
<td>Dark green</td>
<td>Dark green</td>
</tr>
<tr>
<td>05</td>
<td>Chloroform</td>
<td>Light brown</td>
<td>Light brown</td>
</tr>
</tbody>
</table>
Table-5. AAS Analysis for different elements

<table>
<thead>
<tr>
<th>Macro Nutrients</th>
<th>Micro Nutrients</th>
<th>Heavy Metals (in ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen %</td>
<td>Phosphorous %</td>
<td>Potash %</td>
</tr>
<tr>
<td>3.43</td>
<td>0.26</td>
<td>1.36</td>
</tr>
</tbody>
</table>

Fig-1. Chromatogram

Table-6. Chemical constituents of selected drugs detected through GCMS analysis

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Retention time</th>
<th>Scan</th>
<th>Area%</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>3.17</td>
<td>Methamine</td>
<td>8.67</td>
</tr>
<tr>
<td>02</td>
<td>3.71</td>
<td>Dextroamphetamine</td>
<td>0.94</td>
</tr>
<tr>
<td>03</td>
<td>3.96</td>
<td>Acetic acid, hydroxy-methyl ester</td>
<td>0.45</td>
</tr>
<tr>
<td>04</td>
<td>19.67</td>
<td>Acetic acid,10,11-dihydroxy-3,7,11-trimethyl dodeca-2,6-dienyl ester</td>
<td>1.19</td>
</tr>
<tr>
<td>05</td>
<td>19.80</td>
<td>2-Octen-1-ol,3,7-dimethyl-, isobutyrate, (z)</td>
<td>1.42</td>
</tr>
<tr>
<td>06</td>
<td>19.88</td>
<td>Butanoic acid; 4-butoxy</td>
<td>1.53</td>
</tr>
<tr>
<td>07</td>
<td>20.03</td>
<td>7-Methyl-2-tetradecen-1-ol acetate</td>
<td>0.65</td>
</tr>
<tr>
<td>08</td>
<td>20.10</td>
<td>1-Heptatriacotanol</td>
<td>0.93</td>
</tr>
<tr>
<td>09</td>
<td>20.24</td>
<td>3-(1-Methylhept-1-enyl)-3-methyl-2,5-dihydrofuran-2-one</td>
<td>1.90</td>
</tr>
<tr>
<td>10</td>
<td>20.39</td>
<td>1-Benzoxirel-3-ol,2,2,5a-trimethyl-la-[2-(2-methyl)-1,3-dioxolan-2-yl-l-ethenyl] Perhydro</td>
<td>1.04</td>
</tr>
</tbody>
</table>
Cardiospermum canescens Wall., an herbal drug used by local people of Kanakapura region as a traditional medicine was studied for its phytochemical constituents. The chemical standard reveals loss on drying 19.2%, total ash 4%, acid soluble ash 0.04%. Extractive values for Ethanol 14.19% and for Water 3.94%. Preliminary phytochemical studies revealed the presence of Saponin, tannin, Sterol, Terpenes, Flavonoids, Saponins, and Alkaloids. GC-MS analysis revealed presence of 33 compounds, out of that Methanamine, n-Hexadecanoic acid, Oleic acid, 5, 5, 8a-trimethyl-3,5,6,8a-hexahydro-2H-Chromene and Hexadecanal shows 8.8%, 7.8%, 3.2%, 2.7% and 2.2% area respectively.

Atomic absorption spectroscopy revealed the presence of various elements such as Nitrogen, Phosphorous, Potash, Iron, Manganese, Zinc, Copper and Lead.

The chemical constituents determined in the present work add to the pharmacopeia of the traditional drug sources. Our studies can help to the modern society to use this drug in addition to another species Cardiospermum halicacabum. Since, it is rare in Karnataka. A chemical standard helps in checking the adulterants and substitutes of this drug. This directly helps to checking the quality of herbal drug for the betterment of modern society. The phytochemical studies of Cardiospermum canescens revealed the presence of Phytol, Hexadecanoic acid and 3,7,11,15-Tetramethyl-2-hexadecen-1-ol as exclusive compound in contrast to Cardiospermum halicacabum [5] and therefore this plant, if multiplied through tissue culture studies may serve as a substitute to Cardiospermum halicacabum.

<table>
<thead>
<tr>
<th>No.</th>
<th>R interference</th>
<th>Chemical Standard</th>
<th>GC-MS Retention Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>20.53</td>
<td>1,6,6-Trimethyl-7-(3-oxobut-1-enyl)-3,8-dioxatricyclo[5.1.0(2,4)]octan-5-one</td>
<td>0.75</td>
</tr>
<tr>
<td>12</td>
<td>20.60</td>
<td>2-Myristyloyl pantetheine</td>
<td>0.87</td>
</tr>
<tr>
<td>13</td>
<td>20.72</td>
<td>5,6,6-Tetramethyl-5-(3-oxobut-1-enyl)-1-oxaspiro[2,5]octan-4-one</td>
<td>0.93</td>
</tr>
<tr>
<td>14</td>
<td>20.82</td>
<td>Hexadecanal</td>
<td>2.18</td>
</tr>
<tr>
<td>15</td>
<td>20.95</td>
<td>Pentadecanoic acid, 14-methyl-, methyl ester</td>
<td>1.10</td>
</tr>
<tr>
<td>16</td>
<td>21.04</td>
<td>1-Dodecanol, 3,7,11-trimethyl-</td>
<td>1.87</td>
</tr>
<tr>
<td>17</td>
<td>21.32</td>
<td>4-(2,4-Dimethylcyclohex-3-enyl)but-3-en-2-one</td>
<td>0.53</td>
</tr>
<tr>
<td>18</td>
<td>21.98</td>
<td>5,5,8a-Trimethyl-3,5,6,7,8,8a-hexahydro-2H-chromene</td>
<td>2.66</td>
</tr>
<tr>
<td>19</td>
<td>22.53</td>
<td>3,7,11,15-Tetramethyl-2-hexadecen-1-ol</td>
<td>1.31</td>
</tr>
<tr>
<td>20</td>
<td>22.61</td>
<td>2-Pentadecanone, 6,10,14-trimethyl-</td>
<td>7.77</td>
</tr>
<tr>
<td>21</td>
<td>22.85</td>
<td>3,7,11,15-Tetramethyl-2-hexadecan-1-ol</td>
<td>1.47</td>
</tr>
<tr>
<td>22</td>
<td>23.10</td>
<td>3,7,11,15-Tetramethyl-2-hexadecen-1-ol</td>
<td>1.14</td>
</tr>
<tr>
<td>23</td>
<td>23.50</td>
<td>6-(3-Hydroxy-but-1-enyl)-1,5,5-trimethyl-7-oxabicyclo[4.1.0]heptan-2-ol</td>
<td>0.70</td>
</tr>
<tr>
<td>24</td>
<td>23.65</td>
<td>Hexadecanoic acid, Methyl ester</td>
<td>1.31</td>
</tr>
<tr>
<td>25</td>
<td>24.19</td>
<td>n-Hexadecanoic acid</td>
<td>7.77</td>
</tr>
<tr>
<td>26</td>
<td>25.06</td>
<td>Phytol</td>
<td>0.98</td>
</tr>
<tr>
<td>27</td>
<td>26.34</td>
<td>9,12-Octadecadienoic acid(zz)</td>
<td>0.83</td>
</tr>
<tr>
<td>28</td>
<td>26.83</td>
<td>Oleic acid</td>
<td>3.20</td>
</tr>
<tr>
<td>29</td>
<td>26.70</td>
<td>Octadecanoic acid</td>
<td>1.47</td>
</tr>
<tr>
<td>30</td>
<td>28.34</td>
<td>1-Oxaspiro[2,5]octane, 5,5-dimethyl-4-(3-methyl-1,3-butanediyl)-</td>
<td>0.65</td>
</tr>
<tr>
<td>31</td>
<td>29.03</td>
<td>4,8,12,16-tetramethylheptadecan-4-olide</td>
<td>0.44</td>
</tr>
<tr>
<td>32</td>
<td>29.25</td>
<td>1,2-Benzenedicarboxylic acid, diisoctyl ester</td>
<td>1.25</td>
</tr>
<tr>
<td>33</td>
<td>34.66</td>
<td>Cholest-4,6-dien-3-ol,(3β)-</td>
<td>1.66</td>
</tr>
<tr>
<td>34</td>
<td>37.65</td>
<td>Astaxanthin</td>
<td>0.41</td>
</tr>
<tr>
<td>35</td>
<td>37.73</td>
<td>L-Asparagine,Nt[2-(acetylamino)-4-O-[2-(acetylamino)-2-deoxy-3,4,6-tri-O-(trimethylsilyl)]-β-D-glucopyranosyl]-2-deoxy-3,6-bis-O-(trimethylsilyl)-β-D-glucopyranosyl]</td>
<td>0.46</td>
</tr>
</tbody>
</table>

### IV. Discussion and Conclusion

Cardiospermum canescens Wall., an herbal drug used by local people of Kanakapura region as a traditional medicine was studied for its phytochemical constituents. The chemical standard reveals loss on drying 19.2%, total ash 4%, acid soluble ash 0.04%. Extractive values for Ethanol 14.19% and for Water 3.94%. Preliminary phytochemical studies revealed the presence of Saponin, tannin, Sterol, Terpenes, Flavonoids, Saponins, and Alkaloids. GC-MS analysis revealed presence of 33 compounds, out of that Methanamine, n-Hexadecanoic acid, Oleic acid, 5, 5, 8a-trimethyl-3,5,6,8,8a-hexahydro-2H-Chromene and Hexadecanal shows 8.8%, 7.8%, 3.2%, 2.7% and 2.2% area respectively.

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Acknowledgement

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Reference


